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CLAIMS

1. A computer-aided method for balancing the spectral response characteristics of vertically and transversely-polarized seismic receiver components relative to an in-line polarized seismic receiver component of a three-component seismic transducer employed in a multi-dimensional seismic survey, comprising:

defining limits for near-offset source-receiver trajectory vectors in range and azimuth;

assembling in a computer matrix a plurality of seismic wavefields emanating from near-offset source locations in a common-receiver in-line gather, a common-receiver cross-line gather and a common-receiver vertical gather;

defining a preferred reflection-time window length;

normalizing said common receiver gathers for spherical divergence;

transforming said seismic wavefields from the time domain to the frequency domain;

generating first deconvolution operators for the cross-line component;

applying said first operators to the cross-line and the vertical receiver gathers to form a corrected cross-line component;

generating second deconvolution operators for minimizing vertical component energy;

applying said second deconvolution operators to the cross-line and vertical receiver gathers to form a corrected vertical component.

2. A computer-aided method for balancing the spectral response characteristics time-scale traces representative of vertically and transversely-polarized seismic receiver

components relative to an in-line polarized seismic receiver component of a three-component seismic transducer employed in a three-dimensional seismic survey, comprising:

a) selecting an initial receiver station and assembling in a computer matrix a plurality of seismic wavefields emanating from near-offset source locations in a common-receiver in-line gather, a common-receiver cross-line gather and a common-receiver vertical gather;

b) defining limits for near-offset source-receiver vectors in range and azimuth relative to the initial receiver station;

c) defining a preferred reflection-time window length;

d) normalizing said common receiver gathers for spherical divergence;

e) transforming said seismic wavefields from the time domain to the frequency domain;

f) calculating the terms for the cross-line component for each frequency from

$$\begin{pmatrix} \Sigma_i \cos^2(\theta_i)\,\acute{y}_i\bar{y}_i & \Sigma_i\cos^2(\theta_i)\,\acute{z}_i\bar{y}_i \\ \Sigma_i\cos^2(\theta_i)\,\acute{y}_i\bar{z}_i & \Sigma_i\cos^2(\theta_i)\,\acute{z}_i\bar{z}_i\end{pmatrix}\begin{pmatrix}c(\omega)\\ w(\omega)\end{pmatrix} = \begin{pmatrix}\Sigma_i\sin(\theta_i)\cos(\theta_i)\,\acute{x}_i\bar{y}_i\\ \Sigma_i \sin(\theta_i)\cos(\theta_i)\,\acute{x}_i\bar{z}_i\end{pmatrix};$$

g) solving for the cross-line coupling coefficients, $c(\omega)$ and $w(\omega)$ for each frequency;

h) calculating terms for each frequency for the vertical component from

$$v(\omega)\sum_i \acute{z}_i\bar{z}_i = w(\omega)\sum_i \acute{y}_i\bar{z}_i;$$

i) solving for the vertical coupling coefficients, $v(\omega)$ for each frequency;

j) correcting the cross-line component time-scale trace response characteristics, $y(\omega)$, using

$$y(\omega) = c(\omega)y'(\omega) + w(\omega)z'(\omega);$$

k) correcting the vertical component time-scale trace response characteristics, $z(\omega)$, using

$$z(\omega) = -w(\omega)y'(\omega) + v(\omega)z'(\omega);$$ and

l) displaying, with the aid of a computer graphics program, the corrected cross-line and vertical time scale trace components.

3. The method as defined by claim 2, comprising:

repeating steps a) through l) for all subsequent receiver stations.